gallon heels (liquid and solids remaining after a tank has been emptied using the currently installed transfer jets). Special heel removal equipment could include mixing pumps to suspend the solids in the heel and keep them in suspension for transfer out of the tanks, and pumps to transfer the mixed heel solution from the tanks. Remote technology could be used to rinse inside the tank (DOE 1995). An ongoing program of technology development continues to explore improved retrieval methods. In June 1999, DOE completed a demonstration testing the ability of a specially formulated grout to move and raise the liquid residue from the bottom of the tank to the level of the jet inlet so that more liquid can be suctioned out of the tank and to stabilize the residue that cannot be removed (DOE 1999b). Figure 1-8 illustrates the steps of tank heel removal and stabilization.

Calcine Retrieval

To remove calcine from the bin sets, DOE would need to design, construct, and operate equipment to access the individual storage bins located within the bin set vaults, retrieve the calcine, and decontaminate the internal surfaces of the bins. Calcine retrieval is expected to use pneumatic techniques similar to the system used to transfer calcine from the New Waste Calcining Facility calciner to the bins. An air jet would agitate the calcine, and a suction nozzle would lift the agitated calcine out of the bin. This technique is expected to remove more than 99 percent of the stored calcine. If required, further cleaning could involve the use of robotics to remove additional calcine from the floor of the bins or other techniques to remove calcine from bin wall surfaces. DOE is examining cleaning techniques that are suitable for remote operation in the high radiation fields in the bins, are compatible with the bin materials, minimize secondary waste generation and environmental impacts, and enhance worker safety.

1.2.4 HIGH-LEVEL WASTE MANAGEMENT IN A NATIONAL CONTEXT

Four DOE sites now manage HLW: INEEL, the Savannah River Site in South Carolina, the Hanford Site in Washington, and the West Valley Demonstration Project in New York. DOE processed spent nuclear fuel at the first three sites. Although the West Valley Demonstration Project was a commercial spent nuclear fuel processing facility, under the West Valley Demonstration Project Act (Public Law 96-368), DOE has responsibility for the treatment of the HLW inventory and disposition of the facilities used during the demonstration.

As a result of processing spent nuclear fuel, DOE has generated approximately 100 million gallons of liquid HLW complex-wide. Approximately 90 percent of this waste remains in storage in liquid form. DOE is proceeding with plans to treat the liquid HLW, converting it to solid forms that would not be readily dispersible into air or leachable into groundwater or surface water. The main way to convert the waste is by vitrification. Vitrification would be expected to produce approximately 22,000 canisters (the canisters vary in volume of vitrified HLW from 0.6 to 1.2 cubic meters) from the current inventory of HLW at all four sites. The INEEL HLW represents approximately 8 percent of the total DOE inventory of immobilized HLW canisters. DOE plans to dispose of the canisters in a geologic repository (DOE 1997b).

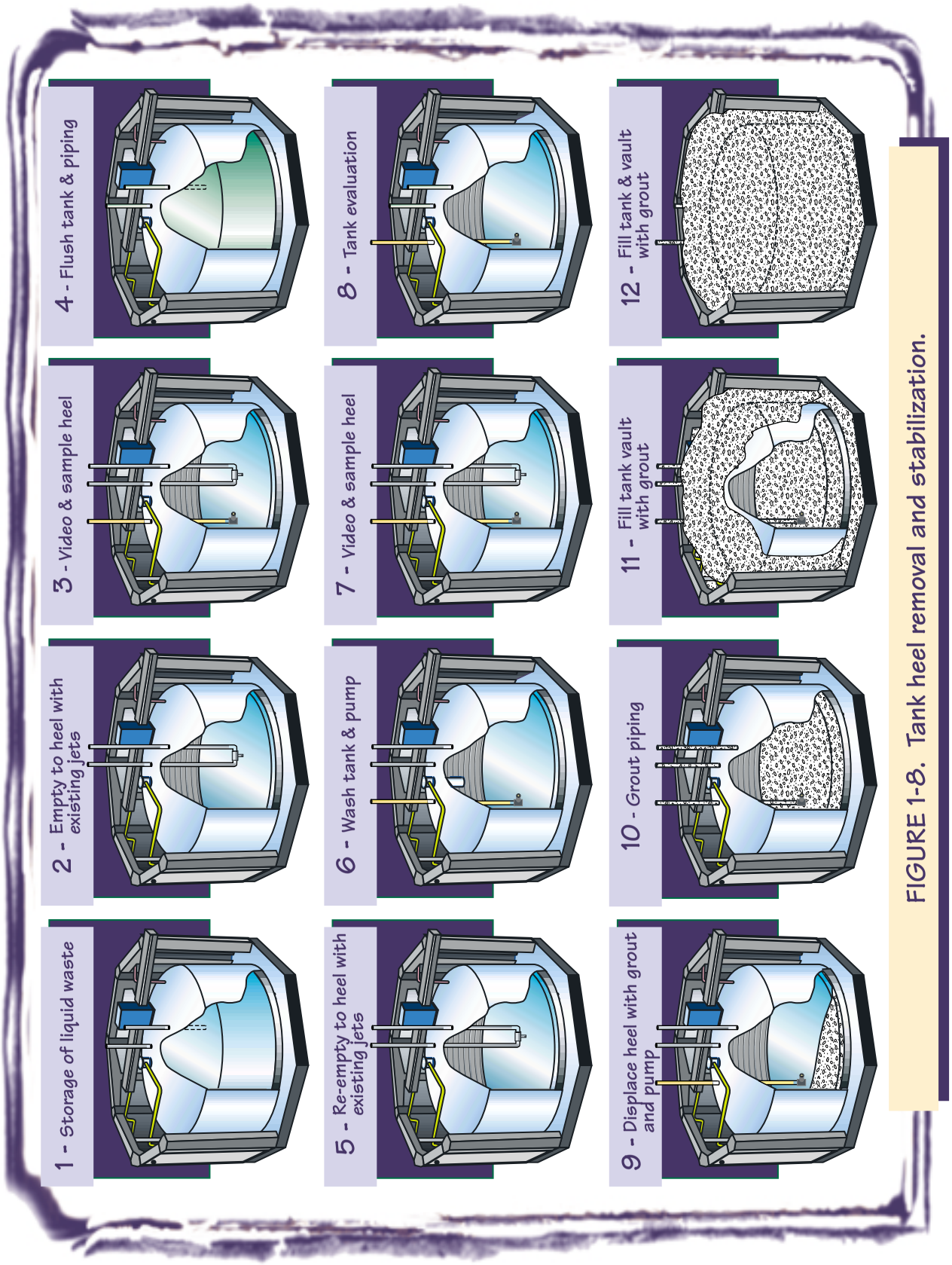


FIGURE 1-8. Tank heel removal and stabilization.

The following sections describe the current status of DOE's HLW management and facility disposition activities at the other sites. The map inside the cover of this EIS indicates the location of these DOE sites.

Savannah River Site

The Savannah River Site currently manages approximately 34 million gallons of HLW in 2 Tank Farms containing a total of 51 tanks. In 1982, DOE prepared an EIS for the Defense Waste Processing Facility, a system for treatment of HLW at the Savannah River Site that includes HLW pretreatment processes, a Vitrification Facility, Saltstone Manufacturing and Disposal, glass waste storage facilities, and associated support facilities (DOE 1982a). That EIS, its Record of Decision, and a subsequent Environmental Assessment, *Waste Form Selection for Savannah River Plant High-Level Waste* (DOE 1982b) provided environmental impact information that DOE used in deciding to construct and operate the Defense Waste Processing Facility to immobilize the HLW generated from processing activities in borosilicate glass. Modifications to the original design for the Defense Waste Processing Facility were implemented following the publication of the 1982 EIS. In a Record of Decision for a supplemental EIS (DOE 1994a), DOE decided to begin operation of the Defense Waste Processing Facility system.

The pretreatment processes would separate HLW into HLW and low-level waste fractions. Since 1990, certain low-level wastes have been blended with cement, slag, and flyash to create a concrete-like waste form known as "saltstone." The saltstone mixture is disposed of onsite in large concrete vaults. In 1996, the vitrification facility began immobilizing the HLW sludges in borosilicate glass. As canisters of vitrified waste are produced, they are stored in shielded, underground concrete vaults pending disposal in a geologic repository.

In 1996, DOE developed the general protocol and performance objectives for operational closure of the Savannah River Site HLW tanks in consultation with the South Carolina Department of Health and Environmental Control and EPA Region IV (DOE 1996a). DOE completed the first closure of a Savannah River Site HLW storage tank in 1997. This closure configuration includes *in situ* stabilization of the residual material (the tank heel) that cannot practicably be removed using available waste removal techniques.

Hanford Site

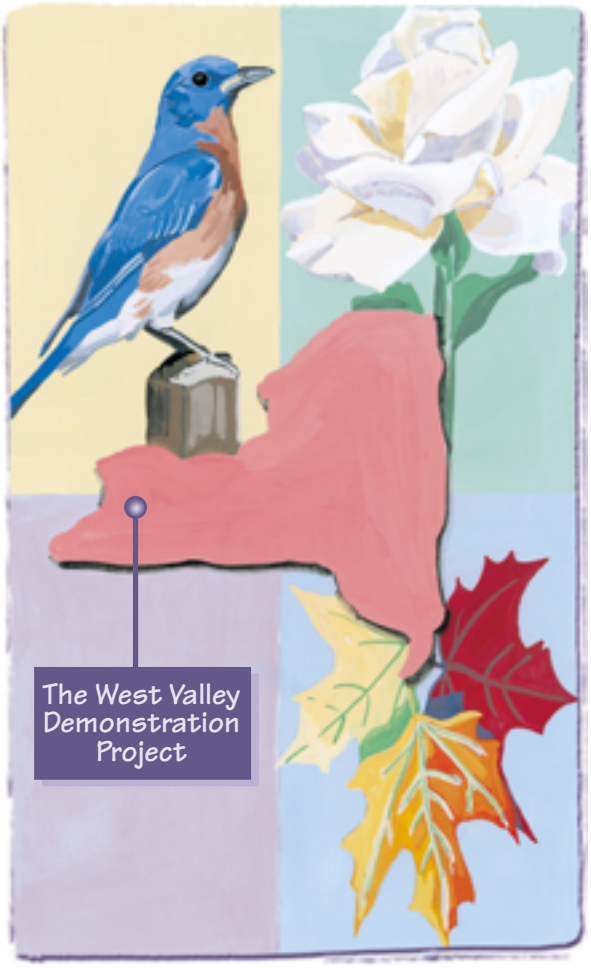
The Hanford Site currently manages approximately 54 million gallons of HLW in 177 underground tanks (149 single-shell tanks and 28 double-shell tanks). The waste consists of highly alkaline sludge, saltcake, slurry, and liquids. The *Tank Waste Remediation System Final EIS*, issued in August 1996, evaluated management and disposal alternatives for the Hanford tank waste. The Record of Decision calls for phased implementation of the proposal to retrieve the waste, separate it into HLW and low-activity waste fractions, vitrifying both fractions, with the low-activity waste disposed of onsite and the HLW stored onsite until it can be shipped offsite for disposal in a geologic repository (DOE 1996b). Closure of the Hanford HLW tanks will be the subject of a future National Environmental Policy Act review.

DOE plans to acquire Hanford tank waste treatment and immobilization services for Phase I from a private vendor who will design, construct, and operate the facilities. In 1997, DOE entered into a Memorandum of Understanding with the Nuclear Regulatory Commission (62 FR 1286; March 18, 1997) for support in regulating the nuclear, radiological, and process safety of these private facilities. The Memorandum establishes a cooperative process to help DOE develop a regulatory program that is consistent with the Nuclear Regulatory Commission's regulatory approach. The process will facilitate the possible transition of the regulatory responsibilities from DOE to the Nuclear Regulatory Commission at some later date.

West Valley Demonstration Project

The Western New York Nuclear Service Center is owned and managed by the New York State Energy Research and Development Authority. The Center contains a commercial spent nuclear fuel processing facility that operated from 1966 to 1972 and generated approximately 600,000 gallons of liquid HLW. Under the West Valley Demonstration Project Act of 1980, DOE assumed possession of the portion of the facility that includes the former reprocessing facility and the HLW tanks, waste lagoons, and waste storage areas. The Act also assigned the Nuclear Regulatory Commission to provide oversight in the areas of radiation health and safety.

In 1982, DOE prepared an EIS and then issued a Record of Decision for the operation of the West Valley Demonstration Project that selected concentration and chemical treatment followed by vitrification as the immobilization technology for the Project's HLW inventory (47 FR 40705;



September 15, 1982). Vitrification of the HLW began in July 1996. Approximately 300 canisters of vitrified HLW are being produced and stored, pending disposal in a geologic repository (DOE 1997b).

In 1996, DOE and the New York State Energy Research and Development Authority prepared a draft EIS (not yet finalized) that evaluates alternatives for completion of the West Valley Demonstration Project activities including management of the wastes produced from vitrifying the liquid HLW, dispositioning of the associated tanks and facilities, and long-term management or closure of the West Valley site (DOE 1996c, 1997c). The Nuclear Regulatory Commission will develop decommissioning criteria for the site, based on the results of this EIS, and review the closure reports and performance assessments prepared for closure, including its incidental waste determination (NRC 1998).

Geologic Repository at Yucca Mountain

The Nuclear Waste Policy Act, as amended (42 USC 10101 et seq.), establishes a process for determining whether to recommend the site to the President for development of a repository. As part of this decisionmaking process, the Secretary of Energy is to undertake the physical characterization of the Yucca Mountain site. If DOE recommends approval of the site and if the President considers the site qualified for an application for construction authorization, the Nuclear Waste Policy Act, as amended, directs the President to submit a recommendation of the site to Congress. Within 60 days of the day the President recommends the site, the Governor and Legislature of the State of Nevada can submit a notice of disapproval of the site to Congress. If the Governor and Legislature do not submit a notice of disapproval within 60 days, the site designation becomes effective. If they submit a notice of disapproval, the site is disapproved unless Congress passes a resolution approving the repository site during the first period of 90 calendar days of continuous session.

Section 114(d) of the Act instructs the Nuclear Regulatory Commission to limit the first repository to emplacement of a quantity of spent nuclear fuel containing 70,000 metric tons of heavy metal (MTHM) or a quantity of solidified HLW resulting from reprocessing that amount of spent nuclear fuel until a second geologic repos-

Metric Tons of Heavy Metal (MTHM)

Quantities of unirradiated and spent nuclear fuel and targets are traditionally expressed in terms of metric tons of heavy metal (typically uranium), exclusive of other materials, such as cladding, alloy materials, and structural materials. A metric ton equals approximately 2,200 pounds. Section 6.3.2.4 more fully describes issues related to MTHM.

itory is in operation. Current projections of the spent nuclear fuel and HLW inventories from civilian and government sources exceed 70,000 MTHM.

In a report required by Section 8 of the Nuclear Waste Policy Act of 1982 (Public Law 97-425), the Secretary of Energy was required to recommend to the President whether defense HLW should be disposed of in a geologic repository with commercial spent nuclear fuel. Table 1-1 of that report, *An Evaluation of Commercial Repository Capacity for the Disposal of Defense High-Level Waste* (DOE 1985), provided MTHM equivalence for HLW.

The MTHM quantity for spent nuclear fuel is determined by the actual heavy metal content of the fuel. The Nuclear Waste Policy Act also specifies that the 70,000 MTHM limitation as it applies to HLW is to be determined by the "...quantity of solidified high-level radioactive waste resulting from the reprocessing of such a quantity of spent nuclear fuel...." That method of determining an MTHM "equivalence" does not recognize the differences in radiological content between spent nuclear fuel and HLW (i.e., HLW has much lower levels of radionuclides).

DOE would emplace 10,000 to 11,000 waste packages containing no more than 70,000 MTHM of spent nuclear fuel and HLW in the repository. Of that amount, 63,000 MTHM would be spent nuclear fuel assemblies that would be shipped from commercial sites to the repository. The remaining 7,000 MTHM would consist of about 2,333 MTHM of DOE spent nuclear fuel and HLW currently estimated to be approximately 8,315 canisters (the equivalent of 4,667 MTHM) that DOE would ship to the repository (DOE 1999c). To determine the number of canisters of HLW included in the waste inventory, DOE used 0.5 MTHM per canister of defense HLW. DOE has recognized that determination of appropriate MTHM equivalence was necessary, therefore, DOE considered several equivalency techniques, including the method based on spent nuclear fuel reprocessed, a method based on total radioactivity in the material, and a method based on radiotoxicity (Knecht et al. 1999). For a brief description of these techniques see Chapter 6. Though DOE has recognized these other equivalency techniques, DOE will use the 0.5 MTHM per canister approach. DOE has used the 0.5 MTHM per canister approach since 1985 (DOE 1985).

DOE is continuing to conduct site characterization activities at Yucca Mountain to determine whether that site is suitable for geologic disposal of spent nuclear fuel and HLW. DOE has prepared a draft EIS (DOE 1999c) that evaluates potential environmental impacts from the construction, operation and monitoring, and eventual closure of the repository, including potential long-term post-closure effects. The final EIS is scheduled to be completed in the year 2000 and will accompany any Secretary of Energy recommendation to the President as required by the Nuclear Waste Policy Act.

Final technical standards for the HLW to be disposed of in the geologic repository are not yet

available. Analyses in the repository EIS and other DOE National Environmental Policy Act documents and decisions based on these analyses regarding management of spent nuclear fuel and HLW are based on the best available knowledge regarding these draft technical standards. DOE will evaluate alternative treatments for the HLW at INEEL based on the current waste acceptance criteria for the candidate repository (DOE 1996d, 1999d; TRW 1997).

1.2.5 REGULATORY FRAMEWORK FOR HIGH-LEVEL WASTE MANAGEMENT

Environmental restoration and waste management activities at INEEL are subject to numerous laws and regulations that apply to the treatment, storage, and disposal of wastes, and the determination of cleanup standards and schedules. This section discusses the specific requirements for management of HLW and disposition of associated facilities at INTEC. This information is repeated in Chapter 6, Statutes, Regulations, Consultations and Other Requirements, which also provides supplemental information on environmental regulations and DOE-ID's compliance status.

Federal and state requirements for the management of HLW and disposition of associated facilities at INTEC include those established under:

- Atomic Energy Act
- Nuclear Waste Policy Act
- EPA Environmental Radiation Protection Standards
- Resource Conservation and Recovery Act
- Comprehensive Environmental Response, Compensation, and Liability Act
- Idaho Settlement Agreement/Consent Order and Notice of Noncompliance Consent Order.
- Site Treatment Plan (under the Federal Facility Compliance Act)

Table 1-1 further identifies site-specific agreements between DOE and the State of Idaho that affect the management of HLW and disposition of associated facilities at INTEC. The table also provides a summary of the specific milestones and their current status.

Atomic Energy Act

The Atomic Energy Act of 1954 (42 USC 2011, et seq.) establishes responsibility for the regulatory control of radioactive materials including radioactive wastes. Pursuant to the Atomic Energy Act, DOE established a series of standards called Orders to protect health and minimize danger to life or property from activities at its facilities.

Potential exists for Congress to direct the Nuclear Regulatory Commission to assume regulatory authority over DOE facilities in the timeframe of the activities analyzed in this EIS. DOE has engaged in joint pilot projects with the Nuclear Regulatory Commission to assess the feasibility of Nuclear Regulatory Commission regulation at DOE facilities. Based on these pilot projects, DOE has identified a number of unresolved issues that should be evaluated further. Because DOE is not actively pursuing Nuclear Regulatory Commission regulation of DOE's facilities, the effects of Nuclear Regulatory Commission regulation of DOE-ID facilities, if any, are not discussed in this EIS (Richardson 1999a,b,c,).

Nuclear Waste Policy Act

The Nuclear Waste Policy Act of 1982, as amended (42 USC 10101 et seq.), established a national policy for disposal of HLW and spent nuclear fuel in a geologic repository.

EPA Environmental Radiation Protection Standards

In 1993, EPA issued "Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Waste," codified in 40 CFR 191. These standards provide for isolation of the radioactive portion of the waste in order to limit

Table 1-1. Agreements between DOE and the State of Idaho for operations at INTEC.

Agreement	Summary of milestones	Status of milestones/comments
1992 Consent Order, and Amendments, Resolving a 1990 Notice of Noncompliance under RCRA (Notice of Noncompliance Consent Order)	- DOE must cease use of the five pillar and panel tanks by March 31, 2009 - DOE must cease use of remaining tanks by June 30, 2015 - DOE must close the calciner if operation is not commenced by January 1, 1993, or operation is discontinued for three consecutive years	This Consent Order has been modified three times to reflect changes agreed upon between the State and DOE. None of these milestones are currently in effect.
1994 Modification to Notice of Noncompliance Consent Order	- DOE must calcine all HLW by January 1, 1998 - DOE must evaluate and select technologies for SBW and calcine by June 1, 1995	DOE has met these milestones.
1995 Settlement Agreement/Consent Order, resolving the cases of Public Service Co. of Colorado v. Batt and United States v. Batt	- Begin negotiation of a plan and schedule for treatment of calcined waste by December 1999 - Complete calcination of SBW by December 31, 2012 - Treat all calcined waste by a target date of December 31, 2035 so that it is ready for removal from Idaho	DOE is currently in compliance with this Settlement Agreement/Consent Order. RCRA compliant tanks are planned for operation by 2005 so that existing tanks can be emptied by 2012. Ability to meet commitments for calcination may be affected by subsequent decisions regarding treatment technologies. In the event any required NEPA analysis results in the selection after October 16, 1995, of an action which conflicts with any action identified in this Agreement, DOE or the Navy may request a modification of this Agreement to conform the action in the Agreement to that selected action. Approval of such modification shall not be unreasonably withheld.
1998 Modification to Notice of Noncompliance Consent Order	- DOE must cease use of the pillar and panel tanks by June 30, 2003 - DOE must cease use of the remaining tanks by December 31, 2012	These milestones are in effect, except for the requirement regarding operation of the calciner (see below).

Table 1-1. (continued.)

Agreement	Summary of milestones	Status of milestones/comments
	- DOE must place the calciner in a standby mode by April 30, 1999, unless and until a hazardous waste permit is received. DOE will determine on June 1, 2000 whether to operate or not and submit a schedule for closure or for permitting	
1999 Modification to Notice of Noncompliance Consent Order	- The date for operation of the calciner is extended to June 1, 2000 - Begin submitting monthly air emission reports - Complete a plan and schedule for inspection and corrosion coupon evaluation of the tanks by November 15, 1999	The potential lack of availability of the calciner after June 1, 2000 could impact milestone for completion of calcination by December 31, 2012.

releases to the environment, including releases to underground sources of drinking water, for 10,000 years after disposal. This regulation would be generally applicable to the disposal of HLW or transuranic waste into any disposal system other than the proposed geologic repository at Yucca Mountain, which is exempt from these standards because site-specific standards (proposed 40 CFR 197, "Environmental Protection Standards for Yucca Mountain, Nevada") are being developed. It may therefore be applicable to residual materials left in the tanks or bins at INTEC if DOE determines the residue would be classified as HLW or transuranic waste.

On August 27, 1999 (64 FR 46976), EPA proposed "Environmental Radiation Protection Standards for Yucca Mountain, Nevada" to be codified in 40 CFR 197. These regulations would contain the site-specific public health and safety standards governing storage or disposal of radioactive material within the proposed repository at Yucca mountain.

Resource Conservation and Recovery Act/Idaho Hazardous Waste Management Act

The HLW, mixed transuranic waste/SBW, and associated wastes managed at INTEC are a combination of "characteristic" (e.g., toxic or corrosive) and "listed" hazardous wastes that are regulated under the Resource Conservation and Recovery Act (RCRA) (DOE 1998a). RCRA requires regulated wastes to be treated in accordance with the applicable land disposal restrictions treatment standards before disposal. A technology for treatment of the waste that does not comply with all of the applicable treatment standards could only be used if a treatment variance or determination of equivalent treatment were obtained.

The treated waste form is still considered "mixed waste" under RCRA. Idaho presently has no mixed waste disposal capacity, and the candidate geologic repository at Yucca Mountain would

not accept RCRA-regulated wastes. Therefore, it would also be necessary for DOE to obtain a "delisting" for the treated waste in order to pursue disposal at any unpermitted facility.

The existing INTEC waste management facilities are regulated by the Idaho Division of Environmental Quality and EPA as "interim status" facilities under RCRA. The major existing HLW facilities addressed by this EIS that are regulated under RCRA include:

- Tank Farm
- Calcined Solids Storage Facilities (bin sets)
- New Waste Calcining Facility calciner
- Process Equipment Waste Evaporator
- Liquid Effluent Treatment & Disposal Facility

The Idaho Hazardous Waste Management Act regulates operations and closure of these facilities. New treatment facilities to implement DOE's decisions based on this EIS would also be regulated under RCRA.

Comprehensive Environmental Response, Compensation, and Liability Act

CERCLA, as amended by the Superfund Amendments and Reauthorization Act (42 USC 9601 et seq.), provides a statutory framework for cleaning up waste sites containing hazardous substances and provides an emergency response program in the event of a release (or threat of a release) of a hazardous substance to the environment. The INEEL was placed on the National Priorities List in 1989 due to confirmed releases of contaminants to the environment. The State of Idaho, EPA, and DOE signed a Federal Facility Agreement and Consent Order in 1991 that outlines a process and schedule for conducting investigation and remediation activities at the INEEL. To better manage the investigation and cleanup, the Agreement divides the INEEL into 10 Waste Area Groups.

Facility closure decisions under this EIS must be approved by the Idaho Division of Environmental Quality. In addition, facility disposition decisions must be coordinated with the INEEL Environmental Restoration Program's Record of Decision under CERCLA for Waste Area Group 3. (Waste Area Group 3 is an area containing suspected release sites designated for investigation under the INEEL Federal Facility Agreement and Consent Order which encompasses the INTEC area.)

Notice of Noncompliance Consent Order

In 1992, DOE and the Idaho Department of Health and Welfare signed a consent order to resolve the Notice of Noncompliance issued by EPA Region 10 on January 29, 1990 (Monson 1992). This Notice of Noncompliance Consent Order addresses concerns regarding the RCRA secondary containment requirements for the INEEL HLW tanks by prescribing dates by which the tanks must be removed from service. In accordance with this Consent Order and an August 18, 1998 modification (Cory 1998), five of the tanks (known as pillar and panel tanks) must be removed from service ("cease use") on or before June 30, 2003 and the remaining tanks on or before December 31, 2012. DOE-ID and the Idaho Division of Environmental Quality have agreed to define "cease use" as emptying the tanks to their "heels" (Cory 1998). A third modification to the Consent Order on April 19, 1999 (Kelly 1999) further stipulates that DOE must place the New Waste Calcining Facility calciner in a standby mode by June 1, 2000 unless the facility receives a hazardous waste permit for continued operation.

National Environmental Policy Act

A thorough understanding of environmental impacts that may occur when implementing proposed actions is a key element of Department of Energy decision-making. The National Environmental Policy Act provides Federal agency decision-makers with a process to consider potential environmental consequences (beneficial and adverse) of proposed actions before agencies make decisions. An important part of this process is the opportunity for the public to learn about and comment on proposed agency actions before a decision is made.

Passed by Congress in 1969, the Act requires Federal agencies to consider the potential environmental impacts of their proposed major actions before implementing them. If a proposed action could have a significant impact on the environment, the agency must prepare an Environmental Impact Statement.

Environmental Impact Statement:

A detailed environmental analysis for any proposed major Federal action that could significantly affect the quality of the human environment. A tool to assist in decision-making, it describes the positive and negative environmental effects of the proposed undertaking and alternatives. A draft EIS is issued, followed by a final EIS.

Scoping:

An early and open process in which the public is invited to participate in identifying issues and alternatives to be considered in this EIS. DOE allows a minimum of 30 days for the receipt of public comments.

Alternatives:

A range of courses of action that would meet the agency's purpose and need for action. NEPA requires that an EIS consider a No Action Alternative.

Comment Period:

A regulatory minimum 45-day period for public review of a draft EIS during which the public may comment on the environmental analyses and suggest revisions or additional issues or alternatives to be evaluated in the final EIS. The agency considers these comments in its preparation of the final EIS.

Record of Decision:

A public record of the agency decision, issued no sooner than 30 days after publication of a final EIS. It describes the decision, identifies the alternatives (specifying which were considered environmentally preferable) and the factors balanced by an agency in making its decision.